Introduction

For the past two decades, particularly post the GFC, central banks have fought stubbornly low inflation. Suffice to say, they seem to have overcome that problem! The global economy is now caught in the twin prongs of an energy shock and rampant inflation. For the first time, since the start of the QE era, the capacity of both monetary and fiscal policy to rescue growth (and markets) is constrained by inflation. This creates a challenging – and unfamiliar environment for investors. In short, buckle up!

This quarter we have three articles:

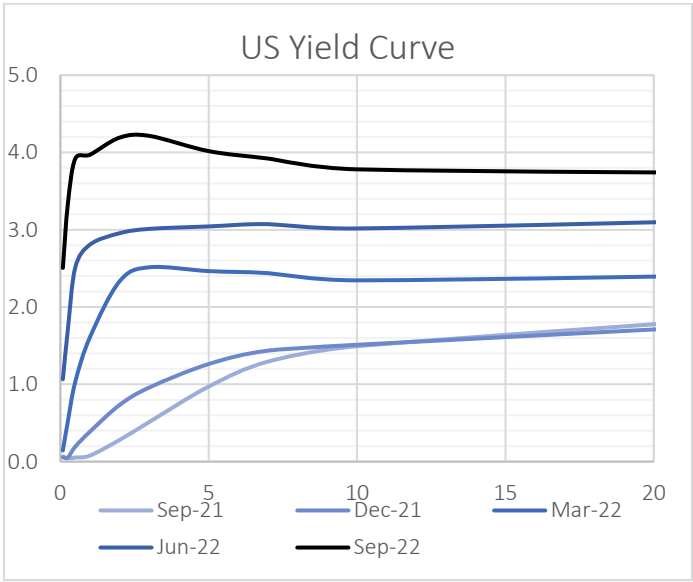
- Utility scale batteries - 'be like water'
- Updates on US inflation
- Upsetting the usual order and units

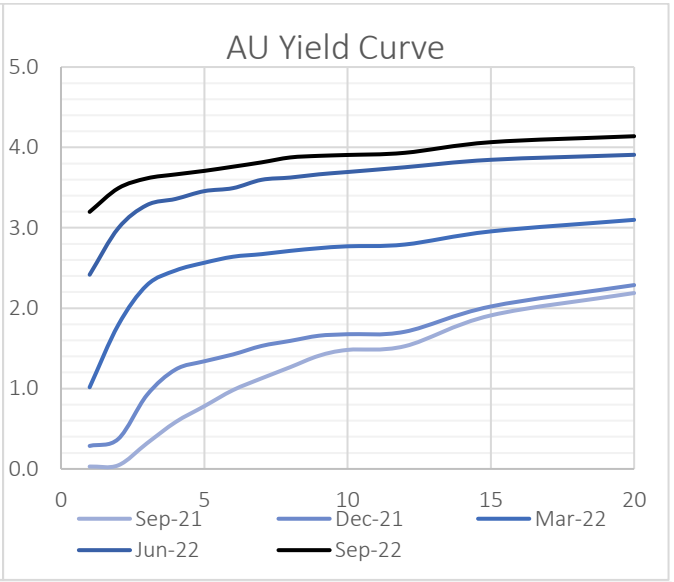
Markets update

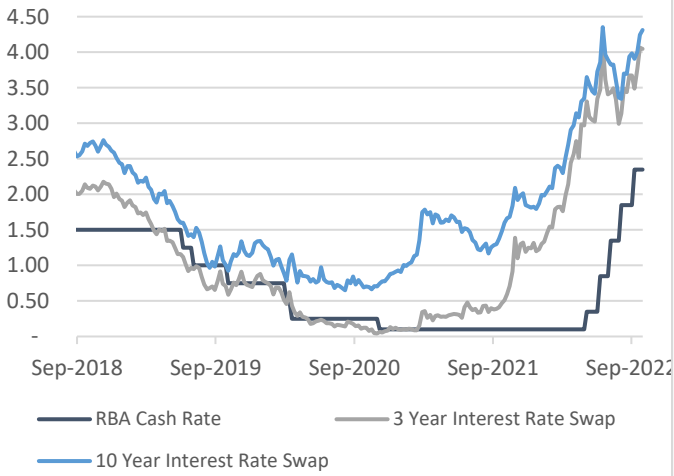
This quarter we have seen a broad-based sell-off in bond portfolios across the globe as yields have risen across all maturities. Jerome Powell has been a man on a mission to fight inflation at any cost. The pace at which Fed has been increasing interest rates has been the fastest since the 1980s. Sharp increases have led to a very strong US dollar – the DXY index has hit its highest point since 2002. The DXY index measures the value of the US dollar relative to a basket of major currencies. We have also observed the deepest US yield curve inversion since 1980s with the spread between 10-year and 2-year treasuries of more than negative 50 basis points at one time during this quarter. The Market believes that the response by the Fed is an overreaction and is forecasting a recession in the coming year, but real rates are still negative and the current inflation reading for the US is at 8.26%.

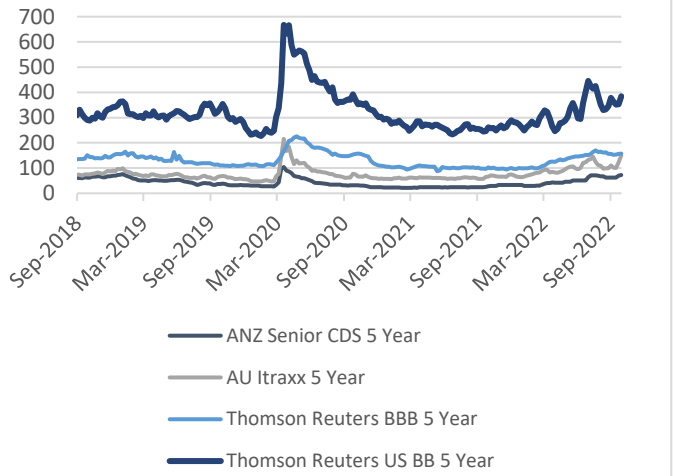
However, the response to inflation has not been the same globally, and we have observed clashes between monetary and fiscal policy with cascading effects on currencies. The UK's new government has announced a large fiscal stimulus for energy subsidies and tax cuts, causing a sharp sell-off of the Sterling and long-dated gilts. The sell-off was so bad that the Bank of England had to step in on the 28th of September to buy long-dated based on liquidity concerns and forecast disruption to capital markets. Thus, in the UK we now have the incongruous combination of simultaneous monetary tightening and quantitative easing.

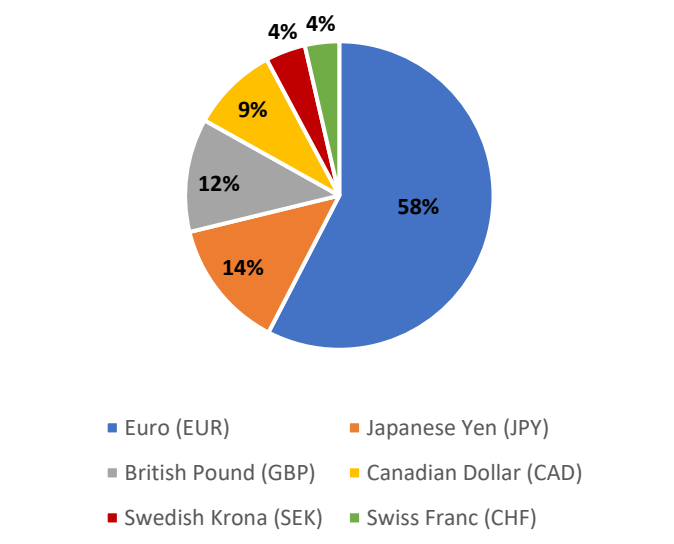
The Australian yield curve remain elevated (relative to recent history) and relatively flat, presumably because the RBA has indicated that the pace of rate rises will slow down in the near future . What is not shown in the charts below is the intra-quarter volatility in base rates – especially as we head into quarter end.











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New issuance and refinancing

Date	Borrower	Instrument	Size ($m)	Term (Yrs)
March	Endeavor Energy	Loan	920	5
September	ACEN Australia renewable platform	Loan	140	N/A
September	Lal Lal Wind Farm	Loan	218	-
September	Port of NSW	Loan	200	12
September	Endeavor Energy	Loan	400	7/10/12
September	RATCH wind portfolio – Mount Emerald, Collector and Collinsville.	Loan	494	3/5/7
August	QIC Pacific Energy Acquisition	Loan	860	3/5
August	Port of Newcastle	Loan	-	-
August	Ausnet Services	Loan	725	10
August	ElectraNet	Loan	450	10
August	Melbourne Airport	Loan	200	5/7
July	Energy Australia	Loan	1000	N/A
July	Pacific Hydro	Loan	1000	N/A
July	Hobart Airport	Loan	571	5/7
June	Darlington Point Solar	Loan	245	5
June	East Coast Rail	Loan	515	1/2/5
June	Aurizon	Loan	1450	2/3/5

Equity and other news

- Consortiums led by Origin, AGL Energy and Iberdrola are in the final bidding round to acquire CWP Renewable and its 1.5 GW portfolio of renewable assets.
- Skip Capital and Stonepeak Partners are in non-exclusive due diligence to acquire Genex Energy at 25 cents a share.
- Not surprisingly, Basslink's appointed receivers have selected APA group as the preferred bidder. APA had previously acquired a substantial portion of Basslink's debt and control the receivers. Basslink is a 370km high voltage interconnector between Victoria and Tasmania.
- Fortescue Metal has announced it will spend $9.2 billion in renewables investment to achieve net zero emissions by 2030. This will include the deployment of an additional 2-3GW of renewable and storage.
- A fund managed by BlackRock is acquiring SolarZero, a household rooftop and battery provider in New Zealand.
- InfraRed Capital Partners and Macquarie's Green Investment Group have jointly sold a 60% stake of the 228MW Victorian Lal Lal wind farm to Igneo Infrastructure Partners.

- The NSW government has awarded $45m of grants to five pumped hydro projects in the states, including Energy Australia's 335MW Lake Lyell project and 600MW Oven Mountain project, Origin's 235MW Shoalhaven Hydro, ATCO's 325MW Central West Hydro and AGL's 250MW Muswellbrook pumped hydro.
- Goldwind is selling its 51% stake in 528MW Stoyard Hill wind farm and 100% stake of 20MW White Rock solar farm.
- Palisade Investment Partner and Spirit Super's proposed acquisition of Geelong Port has been rejected by ACCC's prolonged competition review.
- Amber Infrastructure and DIF Capital Partners agreed to acquire freight rolling stock company Rail First Asset Management.
- Ratch Group will be acquiring Nexif Energy and its 2.67GW portfolio of energy assets in Australia and South-East Asia.
- Australia rail freight company Aurizon Holdings is selling its East Coast Raoil coal haulage business. Non-binding bids are due in September.
- Alinta Energy has been listed for sale by Hong Kong- based conglomerate Chow Tai Fook Enterprises. Alinta Energy has a roughly 3GW power generation portfolio.
- Cleanaway Waste Management has agreed to buy a waste treatment facility in western Sydney from Palisade Investment partners.
- BlackRock Real Assets has acquired Melbourne-based batteries developer Akaysha Energy and committed $1bn over three to five years to roll-out 1GW of utility-scale batteries in Australia.
- UK based fund manager Foresight Group is acquiring Australian fund manager Infrastructure Capital Group.

Sources: Refiniv Eikon, AFR

Utility Scale Batteries - Be Like Water

The first energy revolution came with the invention of the steam engine in the 18th century. This marked the beginning of the industrial revolution and the mining and consumption of coal as a key energy resource. The second energy revolution came in the 1960s as petroleum replaced coal as the most consumed energy. Fossil fuels have since dominated the energy landscape to the present day. We are now on the cusp of the third energy revolution – the renewable era. The dramatic fall in battery prices over the last five years make them a feasible alternative to fossil fuel generation when, to quote that hackneyed phrase, the sun doesn't shine or the wind doesn't blow, and the key to achieving a renewable electricity system.

Batteries allow the grid to deal with the mismatch between generation and demand at any time of the day. They can charge when electricity generation is plentiful and cheap (including being paid to charge) and are able to provide access to power during times of peak demand (when prices are high). They are also have lightning fast response times and can switch between charging and discharging faster than any existing form of generation allowing it to provide lucrative grid stabilisation services (aka the frequency control and ancillary services (FCAS) markets).

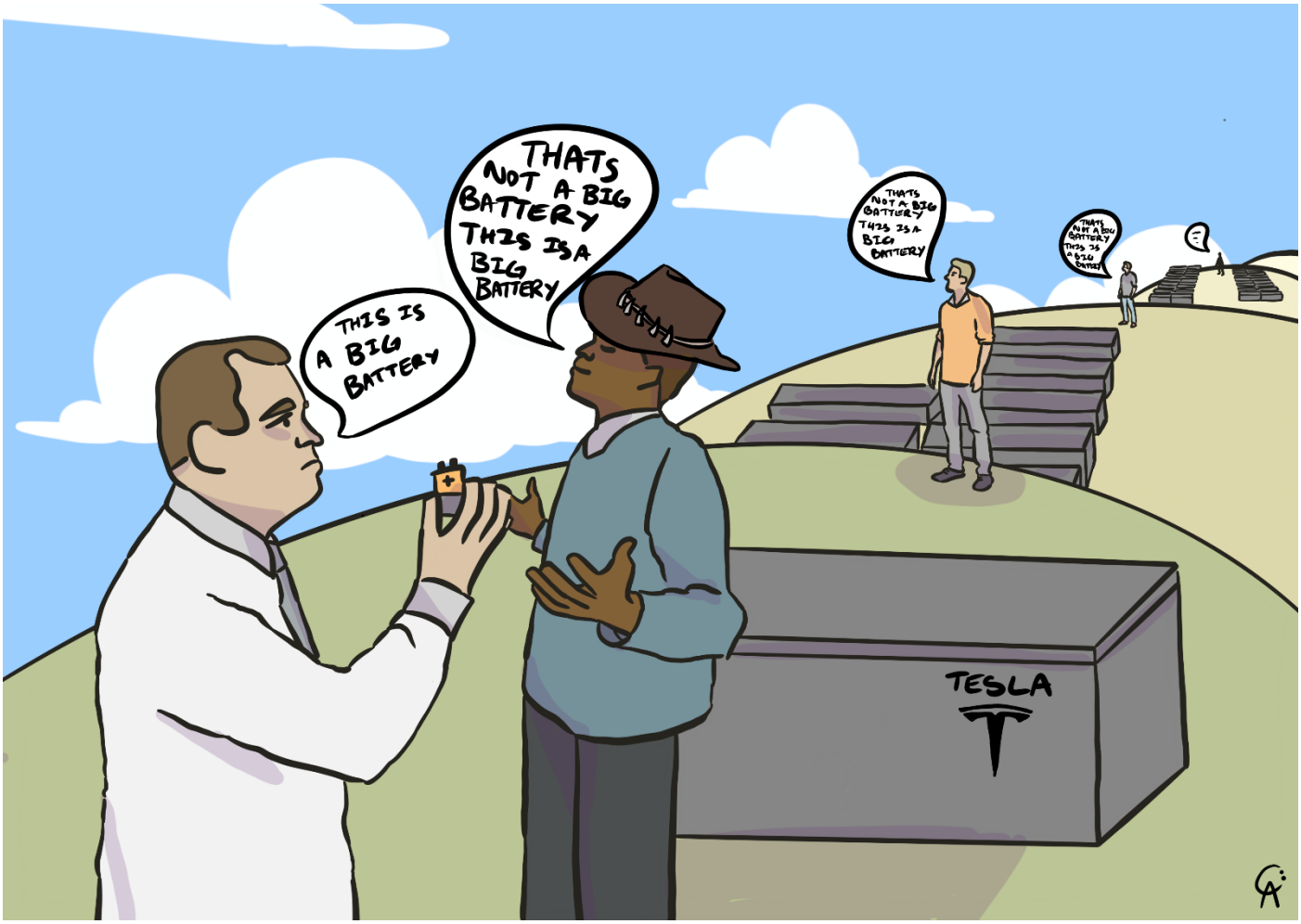
In the pre-renewable energy age electricity demand was effectively fixed and the grid was geared to flex generation up and down to match demand with supply. The choice of supply was between coal versus gas, which was really a trade-off between the cost of fuel and flexibility. Historically we had coal plants that provided the bulk of energy (base load) because coal was cheap. Gas was expensive and, was thus, used to fill the gaps that was not provided by coal.

Fast forward to today and we have variable renewable energy forcing its way into the grid as the lowest cost energy supplier. Power generation is now determined by the time of day and weather. Inherent with renewables is the mismatch between the average time of peak generation (middle of the day) and the average time of peak consumption (the early evening). Renewables are forcing coal out of the system as coal plant are slow and inflexible and are being forced into earning below market returns during the day in the hope of earning higher prices during peak demand and non-renewable generation periods.

The role of batteries is to "be like water" (as the great Bruce Lee once said) and to fill the gaps. The grid requires a large number of batteries, at least equal to the current capacity coal generation in the NEM, to fill the daily demand and supply mismatch. There will be an even larger amount of storage (perhaps pump hydro, perhaps batteries) required to fill the seasonal gaps - such as in winter when solar generation is low or during spring when wind and solar generation is high but demand is low. Storage or dispatchable generation is required to fill this gap. However, the economics are very different between daily versus seasonal storage – perhaps a future newsletter article!

The current wave of batteries uses lithium ion cells. This technology is proven and is used in all manner of electronic devices as well as in electric vehicles. Over time we expect new alternative technology will also gain a larger share (e.g. flow batteries). The key issues for batteries are cost and cycle life. Battery costs have spiked up over the last six months as a result of impact of the Russia/Ukraine conflict. This is due to the spike in key commodity inputs (nickel in particular) as well as due to the general supply chain crunch with the incredible ramp up of EV production. However, just as was the case for wind and solar, we expect technology to improve and costs to come down over the medium to long term (as they have done compared to battery costs two to three years ago).

Batteries will be a big part of the energy transition as we move into the third energy age where renewables supply the majority of our energy needs. Energy security in the renewable era will be very different to that of the fossil fuel era. Batteries are the key to achieving this!



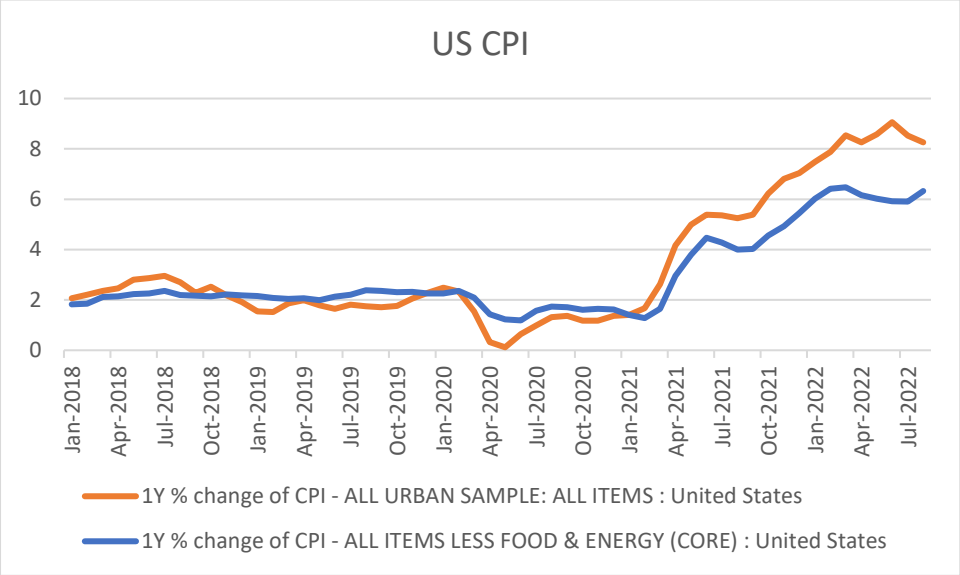
Updates on Inflation

Last quarter we wrote an article on US inflation and in particular what it would take for inflation to get back to 2-3%. Without wanting to rehash that article, the key conclusion was to get inflation back to 2-3% probably required a reasonably large global recession.

Suffice to say, the quarter since, inflation hasn't gone away as item at the forefront of investor's minds.

One development over the last quarter is a material moderation in oil prices. Oil was circa US$110 per barrel at the time of our last newsletter and has fallen to sub US$90 (on a WTI at Cushing basis), a circa 20% fall.

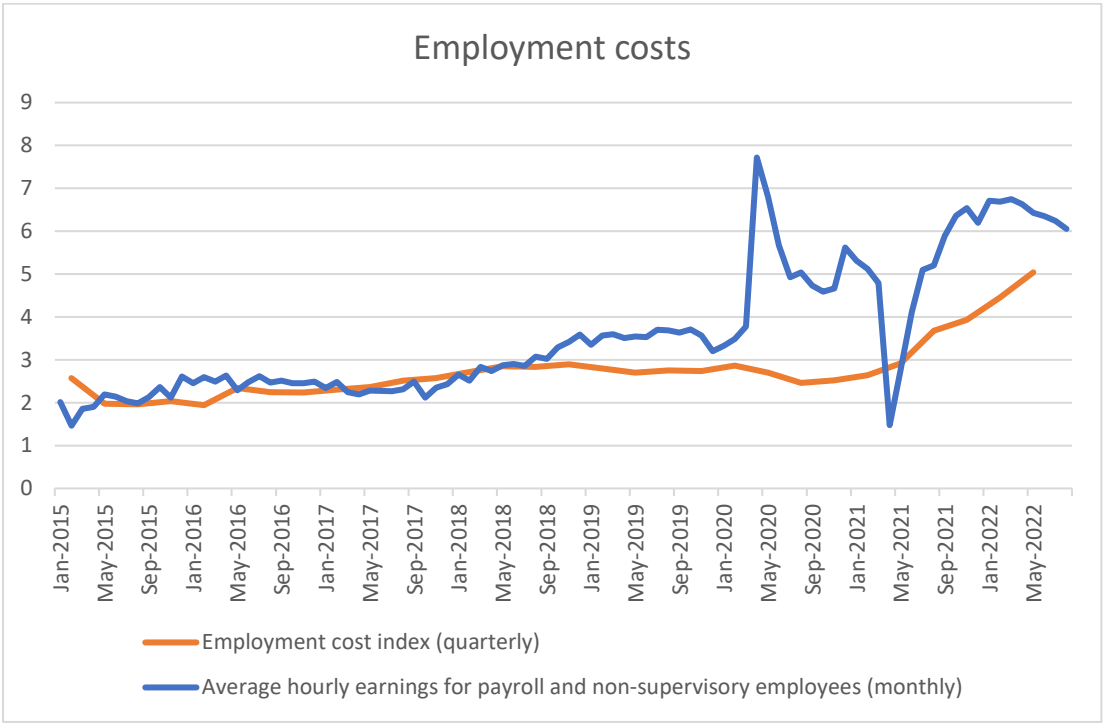
The good news from this is that this has fed into headline CPI, leading to a moderation in headline inflation (see chart below). In the absence of some spectacular new spike in oil prices (eg a new escalation in the Russia/Ukraine situation), it is likely that the peak in headline CPI was in June 2022.



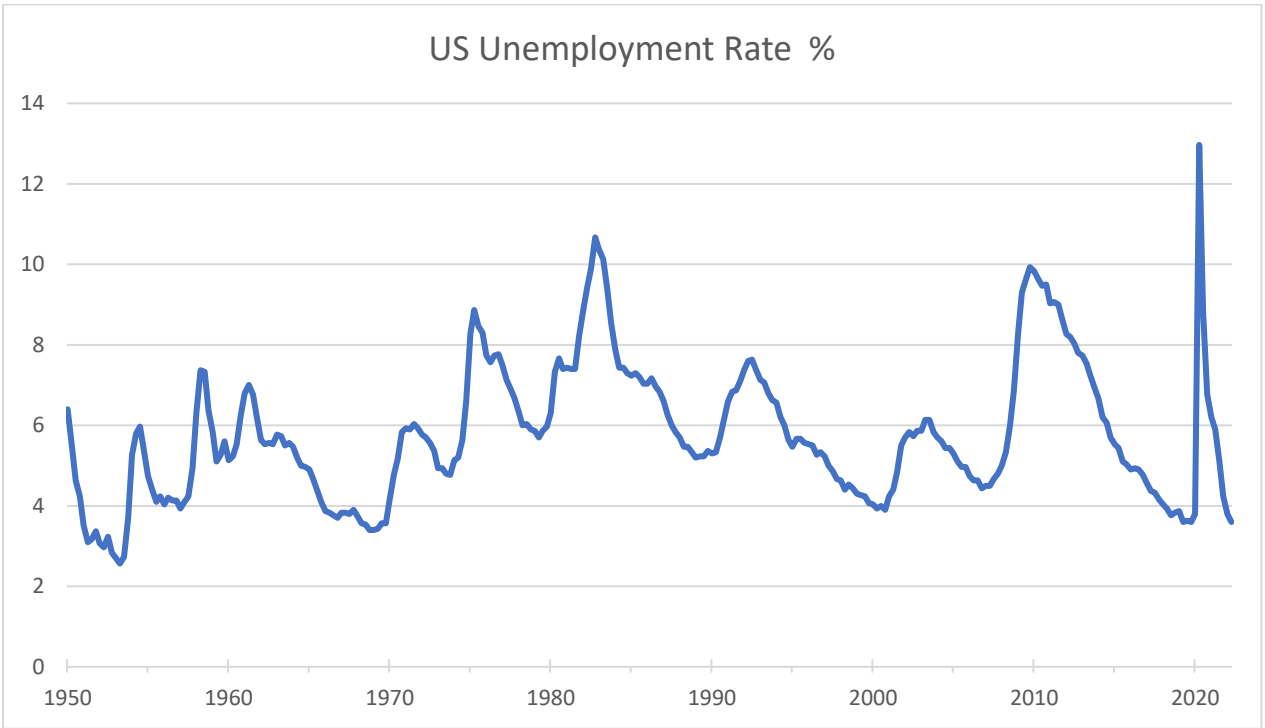
The $64,000 question for investors will be how quickly does it moderate from here (and to what level).

A concerning datapoint in this regard was the increase in core CPI – to 6.3% - in the August CPI release.

The biggest driver of core inflation is wages. That is, higher wages growth usually drives higher core CPI outcomes. There are a range of wages measures in the US – some quarterly and some monthly. The following chart shows the FOMC's preferred measure (the employment cost index – only available quarterly) as well as average hourly earnings for payroll and non-supervisory employees (available monthly).



While the monthly data has some noise in it due to covid lockdowns in early 2021, they both measures indicate that wages are heating up. This is not surprising. Unemployment is very low (see chart below) and inflation is high. Why wouldn't workers be demanding higher pay?



All of this presents a picture that core inflation would be unlikely to moderate until wage inflation also falls.

But what about monetary policy. As central bankers often want to tell us – "Monetary policy acts with long and variable lags".

The key lags we need to worry about are:

- How long before the tightening in monetary policy impacts the labour market, reducing wage inflation pressures; and
- In the meantime – while the labour market remains tight – how much of current headline inflation gets built into wage demands – resulting in a wage-price spiral and high ongoing core inflation.

At one level, while the headline CPI position is improving, the key conclusion of last quarter remains intact. That is, for inflation to head back to 2-3%, itis going to take a significant global recession and, for my guess, central banks are following a plan that is going to give us one.

Upsetting the usual order

One of the banes of my existence, working in energy markets, is the multitude of different units. Everything is measured differently and what's more these conventions are different in different countries. The intention of this article is to both help those who also struggle with the difference between MBTU (millions of British thermal units) and GJ (gigajoules) and MWh (megawatt hours) as well as shine a light on some of the very unusual relative prices that are being seen at the moment.

Common Units

Oil is usually measured in barrels. A barrel of oil is 42 US gallons or approximately 159 litres of crude oil. In energy terms, a barrel of oil is approximately 6.1GJ of energy or 1.7MWh. This will vary somewhat between grades of oil as different types of oil have slightly different energy content.

Gas, in Australia, is measured in gigajoules (that is billions of Joules). This is a simple pure measurement of energy. There are 3.6GJ in a MWh. Offshore, gas is often measured in MBTU that is millions of British thermal units. A British thermal unit is the amount of energy required to raise one pound of water by one degree Fahrenheit (aren't you glad you asked). The good news is that 1 MBTU = 1.055 GJ and so to a rough order of magnitude they are the same a GJ. To keep things confusing, in Europe gas prices are quoted in MWh. To convert these to GJ just divide by 3.6.

Coal is measured in tonnes. Different grades of coal have different energy (so called calorific value). The coal that is the benchmark for Newcastle coal futures is 6,000 Kcal per KG coal. This is pretty good black coal (and is a direct substitute to Russian coal). This means each tonne of this coal contains around 7 MWh of energy. On average, Australian coal fired power stations use lower quality coal than this – particularly the brown coal fired power stations in Victoria.

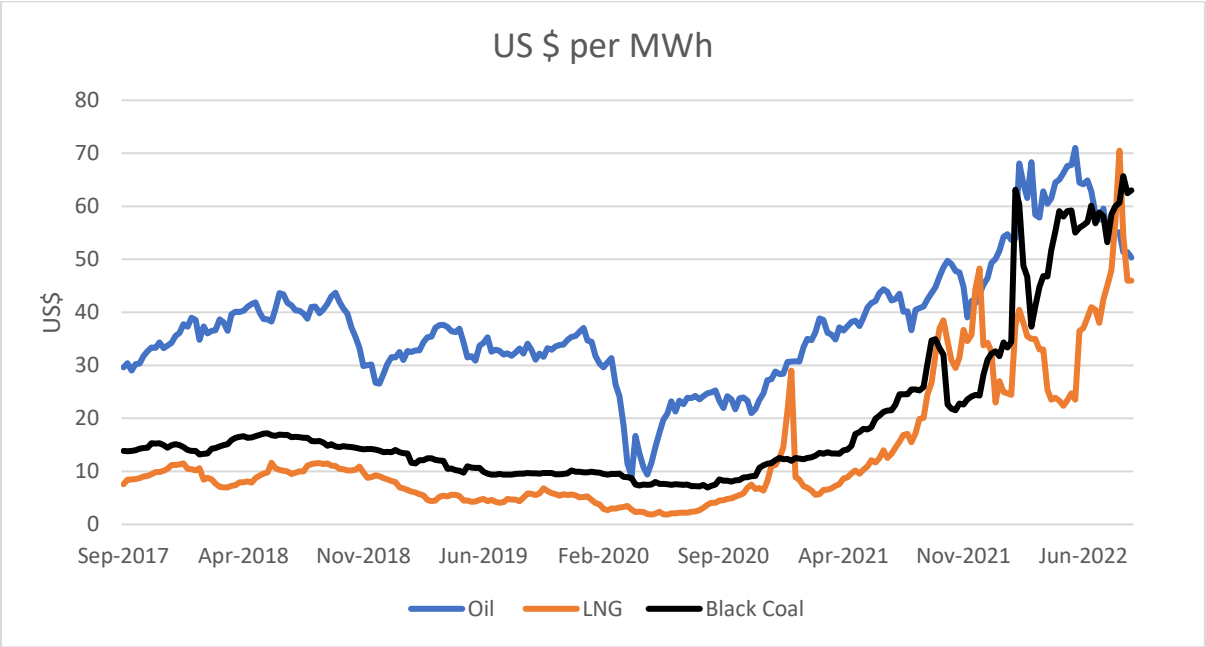
It is important to note that these energy densities capture the pure chemical energy. Power stations are not perfectly efficient – eg a typical gas fired plant has an efficiency of around 40-60%, coal fired plants are significantly lower (typically around 30%).

The table below compares current pricing for these three on a US$ per MWh basis at current periods.

	Oil	LNG	Black Coal
Current Price (US$)	$ 85	$ 42	$ 435
Price Source	West Texas Intermediat	JKL Asian LNG Futures	Newcastle Futures
Usual Measure	Barrel	GJ	tonne 6,000 Kcal/kg
MWh per Measure	1.70	1.00	6.97
US$ per MWh	$ 50.00	$ 42.00	$ 62.41

The results above are actually very unusual. Coal is the most expensive fuel on an energy basis. LNG and oil are relatively similarly priced.

The chart below shows the long-term history of oil, gas and coal prices on a common energy equivalent basis (per MWh).



The normal hierarchy is that oil is the most valuable – reflecting its flexibility as a source of most transport fuels (petrol, diesel and aviation fuel) as well as an input into the petrochemicals supply chain (plastics, etc).

Gas is usually significantly cheaper than oil. Gas can supply both stationary energy and petrochemicals (for example, most fertiliser is made from gas) but because it isn't used in a major way for transport fuels it is inherently lower value. Gas is also more difficult to store and transport than oil and oil products. Gas can be transported by pipelines – but these inherently create a one to one dependency between producer and consumer (as Europe is discovering to its cost with Russian gas). Alternatively, it can be liquified and transported by LNG tanker. However, this is hugely expensive and requires specialist infrastructure at both the export and receiving end.

Historically, Coal has also been cheaper than oil. It can't be used for transport. It has roughly double the CO2 emissions of gas. Other than stationary energy, the main alternative use of coal is for steel making. The one good thing about coal is the 'low tech' nature of its supply chain. In Europe, where they are desperately short energy, there are a range of countries you can import coal from, you don't need particularly specialist infrastructure to transport or import it, and you can store it in a massive pile on the ground (no special tanks or gas storage required).

It is this ease of transport and storage flexibility (as well as its ease in bringing it back online like mothballed plant in Europe) that is a key reason why coal prices have increased by 8-10x compared to 2020, where oil prices have only slightly more than doubled.

However, it does leave Australia's coal fired power stations in somewhat of a quandary. While electricity prices are high – fuel costs are even higher. At US$435 per tonne for coal and 30% efficiency, fuel costs alone are something like A$300/MWh. Coal is no longer the cheap base load source of supply.

While average coal costs are going to be much lower than this, at the margin for black coal plant there has to be a strong incentive to reduce coal use. We are seeing this reflected in a sharp increase in gas fired electricity generation.

This is an example of the international energy crisis having direct impacts on the operation of Australia's electricity and energy system.